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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/961,208	09/24/2001	Takashi Imamura	Q66342	6241

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EXAMINER	
KRONENTHAL, CRAIG W	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 04/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/961,208	IMAMURA ET AL.	
	Examiner	Art Unit	
	Craig W. Kronenthal	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *30 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 September 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed December 30, 2005, has been entered and made of record.

Response to Arguments

2. Applicant's arguments filed with respect to claim 1 have been fully considered but they are not persuasive. Applicant argues in essence that Nishikawa's noise reduction filter does not read on the first shape-dependent filter in accordance with a shape of a microcalcification pattern utilized to create a fine structure image. The examiner disagrees and indicates that Nishikawa discloses the noise filter performing the morphological operations of erosion and dilation (col. 21 lines 15-19). The applicant's specification has defined the first shape-dependent filter to be a morphological filter (Pub. No. US 2002/0057826 A1, paragraph 0022). The specification does not otherwise define the first shape-dependent filter or the resultant fine structure image. Therefore, it can be concluded that Nishikawa's noise filter implementing the morphological operations forms a fine structure image and meets the requirements of the first shape-dependent filter.

Claim Objections

3. Claim 1 is objected to for having an unclear sentence structure. Correction is not required, but the examiner suggests the following:

- Step (i) of claim 1 is written in an unclear manner. Consider revising so that it reads as: performing processing, in which a first shape-dependent filter in accordance with a shape of microcalcification pattern is utilized, on the object image, thereby forming a fine structure image, which illustrates a fine structure area embedded in the object image.
- Step (ii) of claim 1 is written in an unclear manner. Consider revising so that it reads as: performing enhancement processing, in which a second shape-dependent filter in accordance with the shape of the microcalcification pattern is utilized, on the fine structure image, thereby forming an enhancement-processed image, in which the microcalcification pattern has been enhanced.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 23 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 23 and 24 disclose that the fine structure image is formed from subtracting the result of the first shape-dependent filter and the

object image. However, this contradicts claims 1 and 8, which disclose that the fine structure image is the result of the first shape-dependent filter. Therefore, it is unclear how subtracting the fine structure image from the object image yields the fine structure image.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 7, 8, 14, 17, 18, 23, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishikawa et al (P.N. 5,598,481). (hereinafter Nishikawa)

Regarding Claim 1: Nishikawa discloses a method of detecting an abnormal pattern candidate, in which a microcalcification pattern candidate embedded in an object image is detected as an abnormal pattern candidate and in accordance with image information representing the object image, the method comprising the steps of:

- performing processing, in which a first shape-dependent filter in accordance with a shape of microcalcification pattern is utilized, on the object image, a fine structure image, which illustrates a fine structure area embedded in the object

image, being thereby formed [Figure 22B. A noise reduction filter is used as part of a preprocessing technique for detecting calcifications (col. 21 lines 26-29). The noise reduction filter eliminates noise but does not effect small structures thereby creating a fine structure image (col. 21 lines 23-24).],

- Performing enhancement processing, in which a second shape-dependent filter in accordance with the shape of the microcalcification pattern is utilized, on the fine structure image, an enhancement-processed image, in which the microcalcification pattern has been enhanced, being thereby formed [Figure 11A shows the signal-enhanced image which is included in Figure 22B's Linear Filtering. Linear spatial filters are used to form the signal-enhanced image (col. 16 lines 18-21 and 34-37).],
- Detecting the microcalcification pattern candidate by use of the enhancement-processed image [The signal-enhanced image is used in a subtraction process to create a difference image, which is then thresholded to identify microcalcifications (col. 16 lines 18-26).].

Regarding Claim 7: Nishikawa discloses the method in claim 1 wherein the first shape-dependent filter is a morphological filter [The noise reduction filter is the combination of morphological erosion and dilation operators (col. 21 lines 15-19).].

Regarding Claim 8: The analogous arguments of claim 1 are applicable to claim 8.

Regarding Claim 14: The analogous arguments of claim 7 are applicable to claim 14.

Regarding Claim 17: Nishikawa discloses the method of claim 1, wherein the first shape-dependent filter is a morphological filter and the second shape-dependent filter represents an image density pattern of the microcalcification pattern [Nishikawa's noise reduction filter which implements morphological erosion and dilation operators corresponds to the first shape-dependent filter (col. 21 lines 15-19). Nishikawa's spatial filters (Figures 12(a) – 12(c) and 13(a) – 13(f)), which are used for enhancing candidate microcalcifications, represent image density patterns (col. 8 lines 41-45) and therefore correspond to the second shape-dependent filter (col. 17 lines 19-40).].

Regarding Claim 18: Nishikawa discloses the method of claim 1, wherein the first shape-dependent filter is a morphological filter and the second shape-dependent filter represents an image density gradient of the microcalcification pattern [Nishikawa's noise reduction filter which implements morphological erosion and dilation operators corresponds to the first shape-dependent filter (col. 21 lines 15-19). Nishikawa's spatial filters (Figures 12(a) – 12(c) and 13(a) – 13(f)), which are used for enhancing candidate microcalcifications, represent image density patterns (col. 8 lines 35-40) and therefore correspond to the second shape-dependent filter (col. 17 lines 19-40).].

Regarding Claims 23 and 24: The analogous arguments of claim 1 are applicable to claims 23 and 24 in view of the above 35 U.S.C. 112 rejection.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 2, 3, 9, 10, 15, 16, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishikawa in view of Takeo et al. (P.N. 5,714,764). (hereinafter Takeo)

Regarding Claim 2: Image recording conditions yield corresponding read-out conditions such as sensitivity and latitude. Therefore, the argument below regarding claim 3 also holds for the image recording conditions.

Regarding Claim 3: Nishikawa discloses the method as defined in claim 1 for reasons explained above, but does not disclose the following, which is instead disclosed by Takeo:

- A plurality of second shape-dependent filters, which conform to different read-out conditions at the time of object image acquisition, are prepared for the respective read-out conditions,

  Takeo describes the creation of a conversion table, which holds read-out conditions such as sensitivity and latitude (col. 12 lines 5-8)

- A second shape-dependent filter, which conforms to the read-out conditions of the object image to be processed, is selected from the plurality of the second shape-dependent filters having been prepared,

  Takeo explains that the conversion process involves a fiter, which utilizes the above mentioned conversion table (col. 12 lines 9-16).

- The enhancement processing is performed by use of the thus selected second shape-dependent filter (col. 11 lines 29-39). The read-out conditions are adjusted to aid in the enhancement of an image. Therefore it is understood that the conversion process is an enhancement process.

One skilled in the art would be motivated to modify Nishikawa with the teachings of Takeo to create a more specialized filtering procedure so that abnormal regions may be more accurately detected with fewer false-positives, particularly in cases where the image signal change is large (col. 13 lines 45-57).

Regarding Claim 10: The same reasons for rejection apply for this claim as in claim 3 above.

Regarding Claim 9: The same reasons for rejection apply for this claim as in claim 2 above.

Regarding Claim 15: Takeo discloses the method of claim 2, wherein the image recording condition is one of a tube voltage of a radiation source, a radiation dose, a compression force and a compression thickness [The read-out sensitivity (S) (Equation 12) is a function of Sk (Equation 13), which is a function of x-ray source tube voltage and radiation dosage (col. 10 line 59 – col. 11 line 12).

Regarding Claim 16: The analogous arguments of claim 15 are applicable to claim 16.

Regarding Claim 19: Nishikawa discloses the method of claim 1, but does not disclose optimization with respect to a recording apparatus or read-out apparatus. However, Takeo discloses a method for detecting microcalcifications wherein the second shape-dependent filter is optimized with respect to an image recording apparatus and an image read-out apparatus [A conversion table for optimizing an enhanced image based on read-out and recording conditions such as sensitivity and latitude (col. 12 lines 1-16).] It would have been obvious to one of ordinary skill in the art to modify Nishikawa's experimental filtering (col. 17 line 61 – col. 20 line 52) with Takeo's conversion table for filter optimization. One of ordinary skill in the art would be motivated to make this modification to reduce computation time since Takeo's conversion table allows for

automatic processing. Additionally, one would be motivated to modify Nishikawa with Takeo, particularly when the input signal change is large (col. 13 lines 45-57).

Regarding Claim 20: The analogous arguments of claim 19 are applicable to claim 20.

9. Claims 4, 5, 6, 11, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishikawa in view of Doi et al. (P.N. 4,907,156). (hereinafter Doi)

Regarding Claim 4: Nishikawa discloses the method as defined in claim 1 for reasons explained above, but does not disclose the following, which is instead disclosed by Doi:

- A plurality of second shape-dependent filters, which conform to different contrasts of microcalcification patterns embedded in object images, are prepared for the respective contrasts,

  Doi explains that multiple matched filters are created with Fourier spectrums proportional to simulated nodules of a given size and contrast (col. 5 lines 8-10). It should be noted that the SNR-maximizing filter used by Doi enhances the microcalcification or abnormal regions (col. 4 lines 62-65).

- A second shape-dependent filter, which conforms to the contrast of the microcalcification pattern embedded in the object image to be processed, is

selected from the plurality of the second shape-dependent filters having been prepared,

Doi cites an example in which a matched filter is chosen partially because it conforms to the contrast of a microcalcification pattern embedded in an image (col. 5 lines 15-28).

- The enhancement processing is performed by use of the thus selected second shape-dependent filter. (col 5 lines 26-28)

One skilled in the art would be motivated to modify Nishikawa with the teachings of Doi to create a more specialized filtering procedure so that abnormal regions may be more accurately detected with fewer false-positives.

Regarding Claim 5: Nishikawa discloses the method as defined in claim 1 for reasons explained above, but does not disclose the following, which is instead disclosed by Doi:

- A plurality of second shape-dependent filters, which conform to different sizes of microcalcification patterns embedded in object images, are prepared for the respective sizes,

According to Doi, "it is necessary to find a few matched filters, or perhaps just one, which will enhance, to some degree, nodules of various sizes and shapes" (col 5 lines 4-6). Doi explains that multiple matched filters are created with Fourier spectrums proportional to simulated nodules of a given size and contrast (col. 5 lines 8-10). It should be noted that the

SNR-maximizing filter used by Doi enhances the microcalcification or abnormal regions (col. 4 lines 62-65).

- A second shape-dependent filter, which conforms to the size of the microcalcification pattern embedded in the object image to be processed, is selected from the plurality of the second shape-dependent filters having been prepared,

  Doi cites an example in which a matched filter is chosen partially because it conforms to the size of a 9mm nodule embedded in an image (col. 5 lines 15-28).

- The enhancement processing is performed by use of the thus selected second shape-dependent filter. (col 5 lines 26-28)

One skilled in the art would be motivated to modify Nishikawa with the teachings of Doi to create a more specialized filtering procedure so that abnormal regions may be more accurately detected with fewer false-positives.

Regarding Claim 6: Nishikawa discloses the method as defined in claim 1 for reasons explained above, but does not disclose the following, which is instead disclosed by Doi:

- A plurality of second shape-dependent filters, which conform to different combinations of image recording conditions at the time of object image acquisition, read-out conditions at the time of object image acquisition, contrasts of microcalcification patterns embedded in object images, and sizes

of microcalcification patterns embedded in object images, are prepared for the respective combinations,

According to Doi, "it is necessary to find a few matched filters, or perhaps just one, which will enhance, to some degree, nodules of various sizes and shapes" (col 5 lines 4-6). Doi explains that multiple matched filters are created with Fourier spectrums proportional to simulated nodules of a given size and contrast (col. 5 lines 8-10). These matched filters represent combinations of size and contrast, but it is obvious that filters of other combinations could be created. It should be noted that the SNR-maximizing filter used by Doi enhances the microcalcification or abnormal regions (col. 4 lines 62-65).

- A second shape-dependent filter, which conforms to the combination with respect to the object image to be processed, is selected from the plurality of the second shape-dependent filters having been prepared,

  Doi cites an example in which a matched filter conforming to a 9 mm nodule is chosen because it provides the best balance of size and contrast (col. 5 lines 15-28).

- The enhancement processing is performed by use of the thus selected second shape-dependent filter. (col. 5 lines 26-28)

One skilled in the art would be motivated to modify Nishikawa with the teachings of Doi to create a more specialized filtering procedure so that abnormal regions may be more accurately detected with fewer false-positives. It is also obvious to one skilled in the art

of filtering that a greater number of filter combinations available, allows for greater customization and therefore more accurate results.

Regarding Claim 11: The same reasons for rejection apply for this claim as in claim 4 above.

Regarding Claim 12: The same reasons for rejection apply for this claim as in claim 5 above.

Regarding Claim 13: The same reasons for rejection apply for this claim as in claim 6 above.

10. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishikawa in view of applicant's admitted prior art.

Regarding Claim 21: Nishikawa discloses the method of claim 1, including using a morphological filter (col. 21 lines 15-19) for identifying microcalcifications in mammograms (col. 21 lines 26-29). Nishikawa does not expressly disclose that the fine structure image comprises only structures approximately the size of microcalcifications and smaller. However, Applicant's admitted prior art indicates that the morphological filters used for microcalcification detection do not remove microcalcifications and non-calcifications of identical size (Pub. No. US 2002/0057826 A1, p. 2, paragraph [0012]).

Therefore, it would have been obvious to one of ordinary skill in the art to design the morphological filter of Nishikawa, such that the same structures would no be removed. One would have been motivated to make this modification to increase the accuracy of the detection.

Regarding Claim 22: The analogous arguments of claim 21 are applicable to claim 22.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W. Kronenthal whose telephone number is (571) 272-7422. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

March 30, 2006
Craig W. Kronenthal

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